

# AIRS Radiance Validation with the Scanning HIS aircraft instrument

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#### **TOPICS**

- 1. S-HIS: Recent WB57 Integration & Calibration Accuracy
- 2. New 2004 S-HIS data sets, including
  - -- Night Flights
  - -- Arctic Scenes
- 3. Preliminary AIRS Validation comparisons
- 4. Interesting tidbits

# 1. Scanning-HIS: Recent WB57 Integration & Calibration Accuracy

## **UW Scanning HIS: 1998-Present**

(HIS: High-resolution Interferometer Sounder, 1985-1998)

#### **Characteristics**

**Spectral Coverage:** 3-17 microns

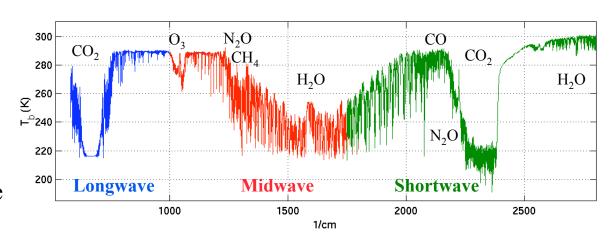
**Spectral Resolution:** 0.5 cm<sup>-1</sup>

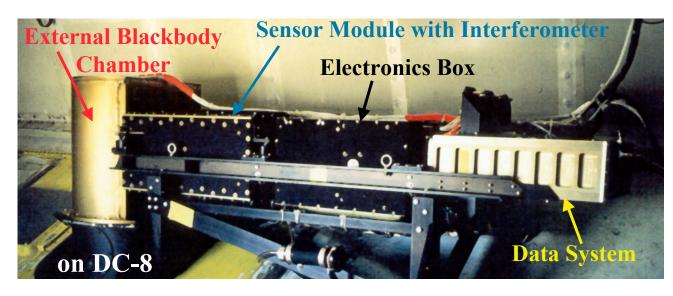
**Resolving power:** 1000-6000

Footprint Diam: 1.5 km @ 15 km

**Cross-Track Scan:** Programmable

including uplooking zenith view

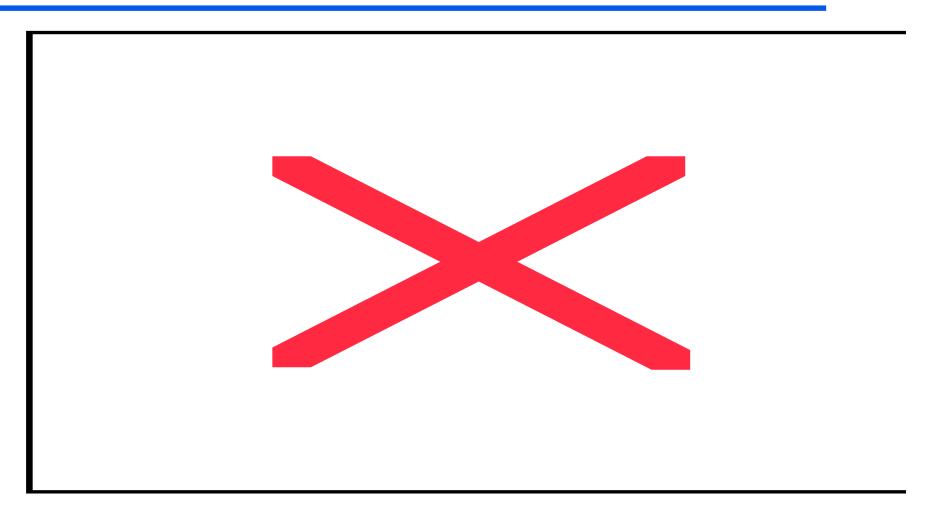




#### **Applications:**

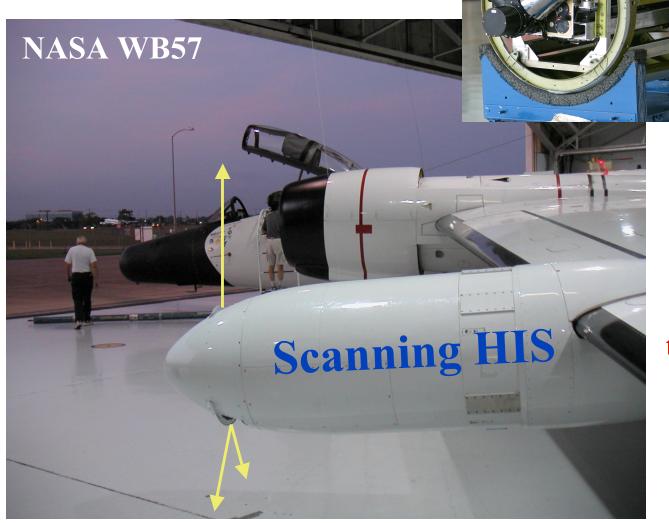
- > Radiances for Radiative Transfer
- > Temp & Water Vapor Retrievals
- > Cloud Radiative Prop.
- Surface Emissivity & T
- > Trace Gas Retrievals

# Scanning HIS Interferometer: with Telescope, Collection optics, & Detectors/Cooler



Laser metrology on bottom of optical bench

### **Aura Validation Expt AVE, 26 October 2004**



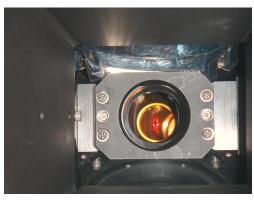
S-HIS
scans crosstrack downward
&
looks upward

Left Wing Pod

# Scanning HIS Integration to WB57 23-26 October 2004



Aerodynamic Buffeting Control



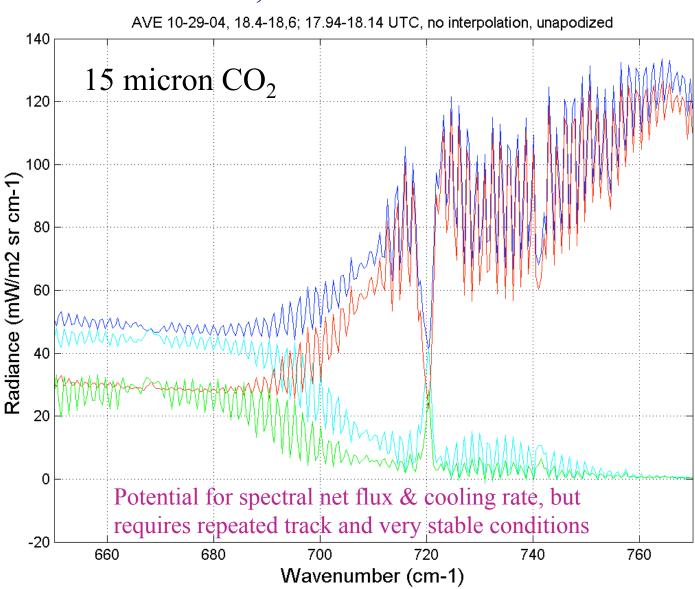
**Up-looking Port** 



Power Conditioning Unit



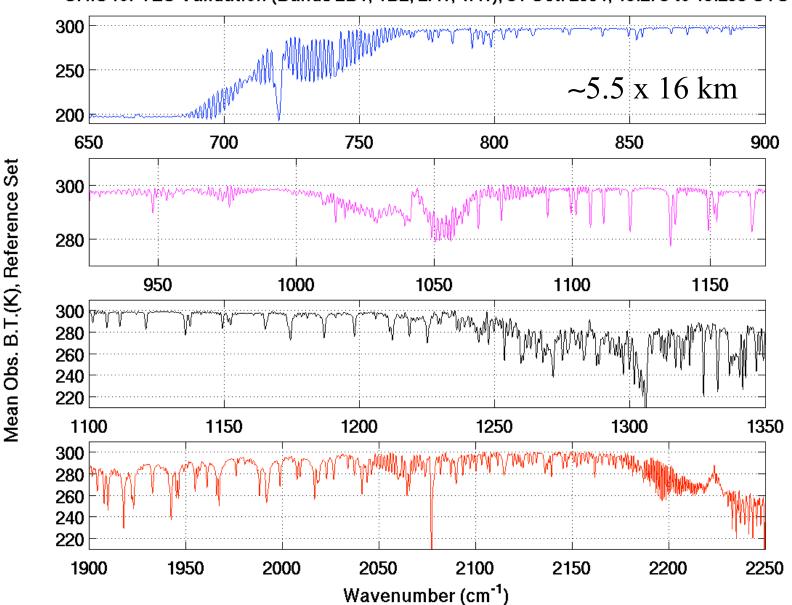
## **S-HIS -2 Altitudes**



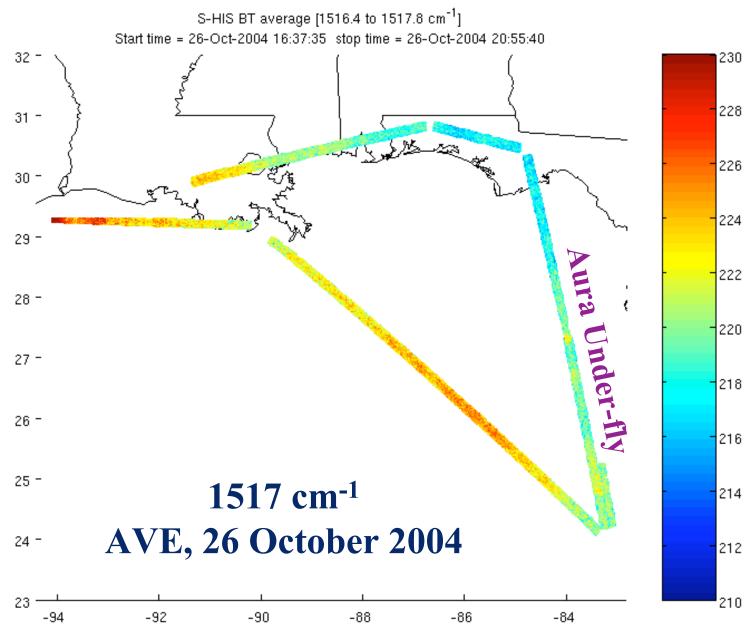
### **S-HIS** –Tropospheric Emission Spectrometer (TES) Bands

near 31 Oct overpass

SHIS for TES Validation (Bands 2B1, 1B2, 2A1, 1A1), 31 Oct. 2004, 19.273 to 19.298 UTC



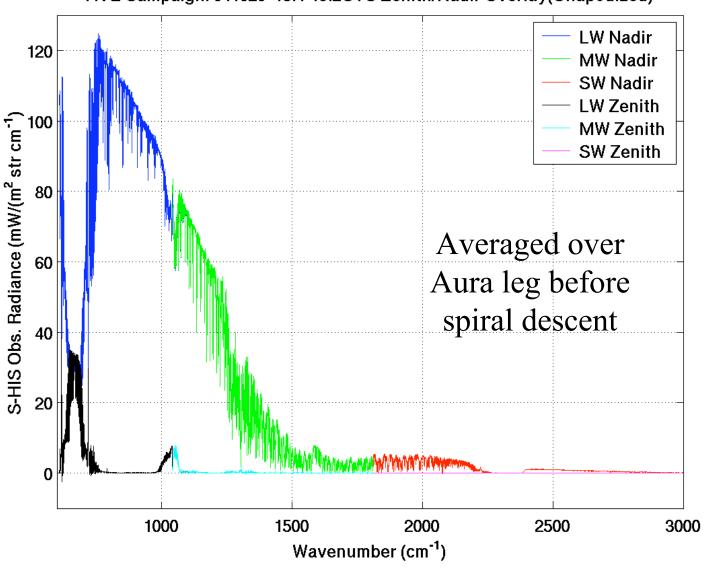
## S-HIS Image, Opaque Water Vapor



# S-HIS Spectra, Nadir and Zenith

AVE, 26 October 2004

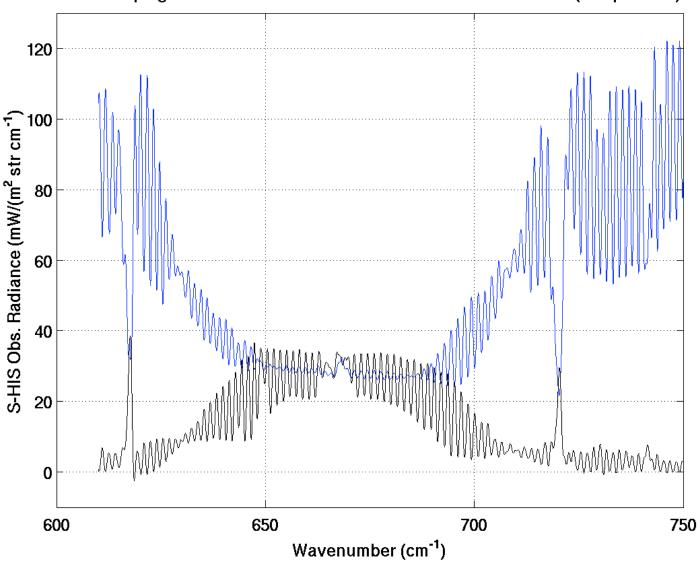
AVE Campaign: 041026 18.4-19.2UTC Zenith/Nadir Overlay(Unapodized)



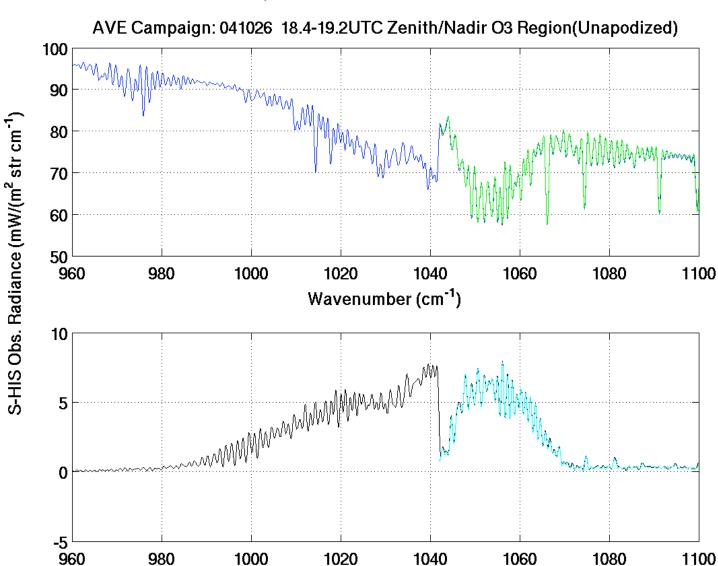
# S-HIS Spectra, 15 μm CO<sub>2</sub>

AVE, 26 October 2004

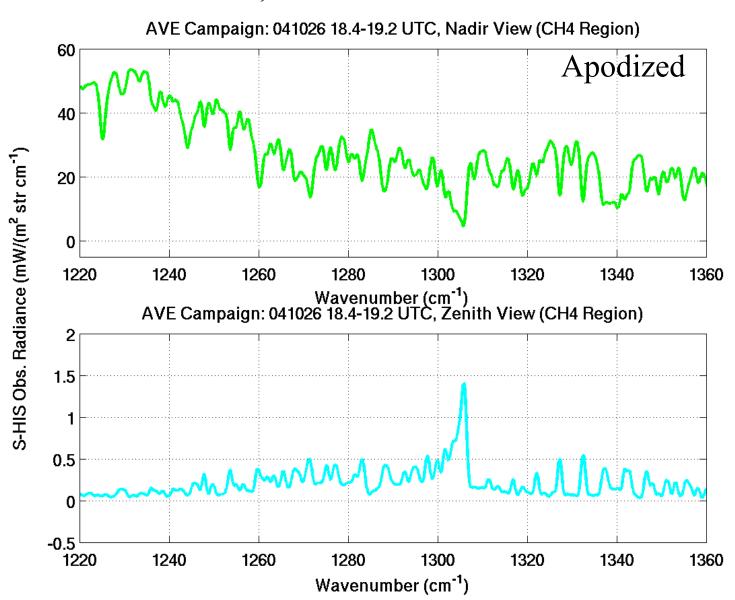
AVE Campaign: 041026 18.4-19.2UTC Zenith/Nadir 15 micron CO2 (Unapodized)



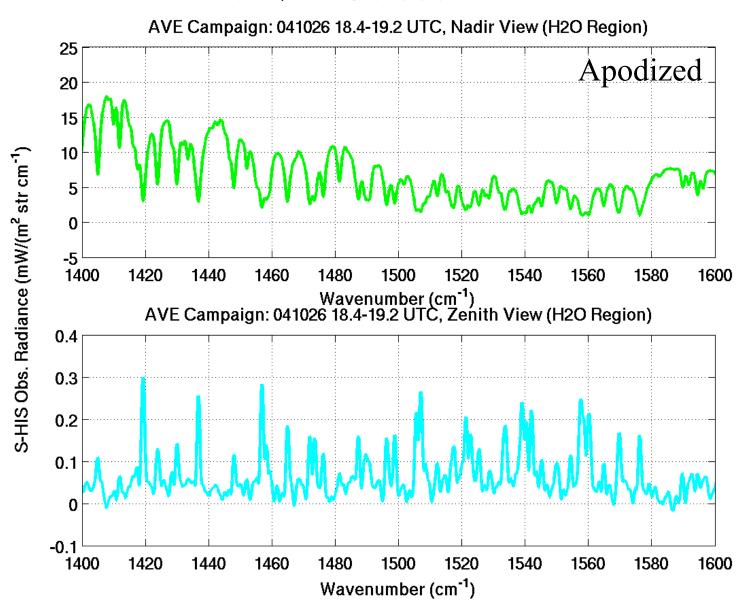
# S-HIS Spectra, $10.6 \mu m O_3$



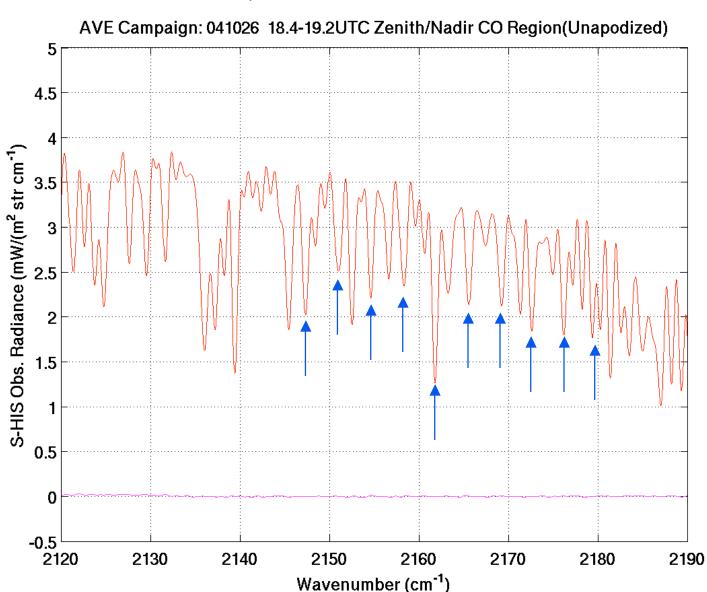
# S-HIS Spectra, 7.7 μm CH<sub>4</sub>



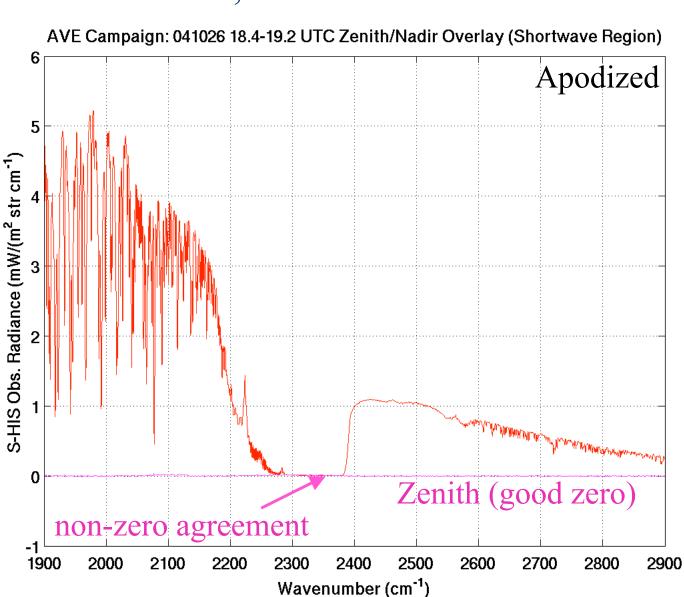
# S-HIS Spectra, 6.3 µm H<sub>2</sub>O



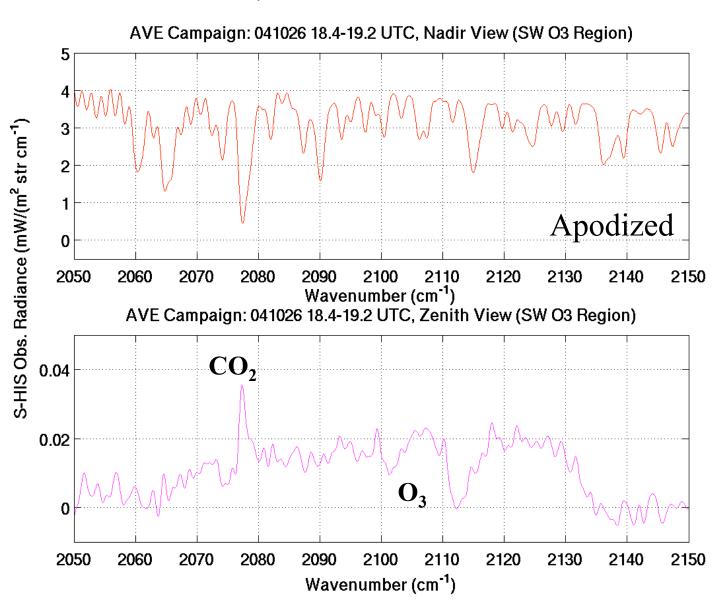
# S-HIS Spectra, 4.67 μm CO



# S-HIS Spectra, SW/4.3 µm CO<sub>2</sub>



# S-HIS Spectra, $4.73 \mu m O_3$

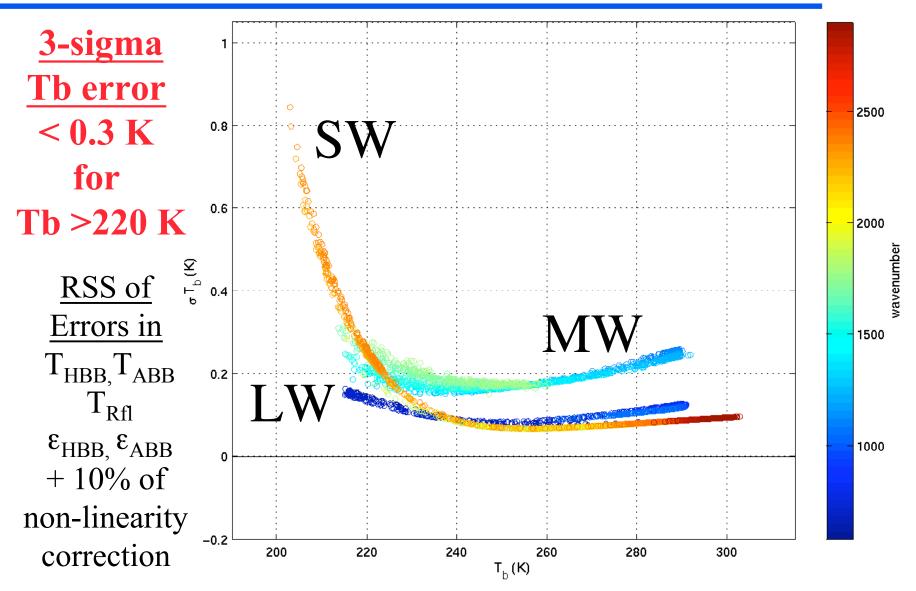




#### Scanning-HIS Radiometric Calibration Budget

TABB= 227, THBB=310, 11/21/02 Proteus

Similar to Best, et al., CALCON 2003



# 2. New 2004 S-HIS data sets including -- Night Flights -- Arctic Scenes

# Scanning-HIS: 2004 Field Experiment Definition

ADRIEX: Aerosol Direct Radiative Impact Experiment

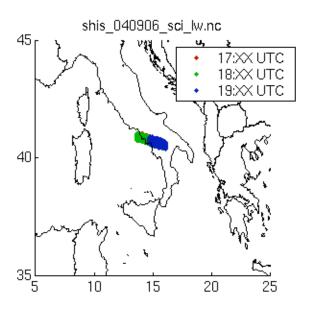
**EAQUATE: European Aqua Thermal Experiment** 

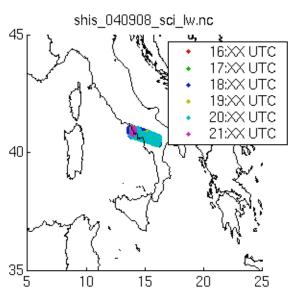
MPACE: Mixed-Phase Arctic Cloud Experiment

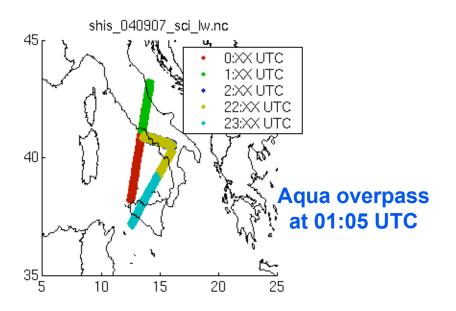
**AVE:** Aura Validation Experiment

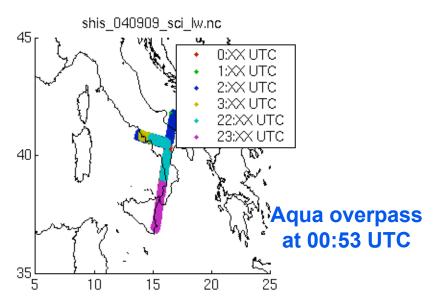
Proteus aircraft used for 1st 3, WB57 for AVE

# ADRIEX Flights- 6,7,8,9 Sept

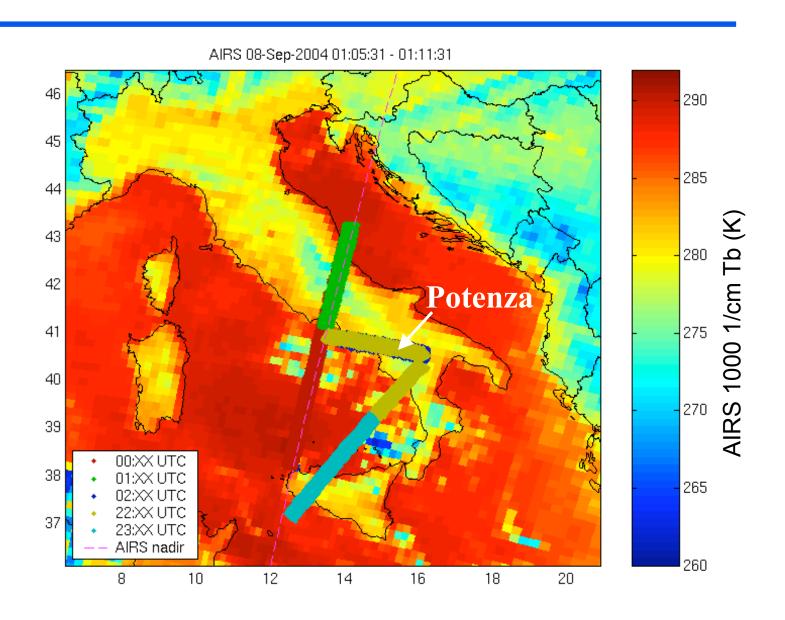




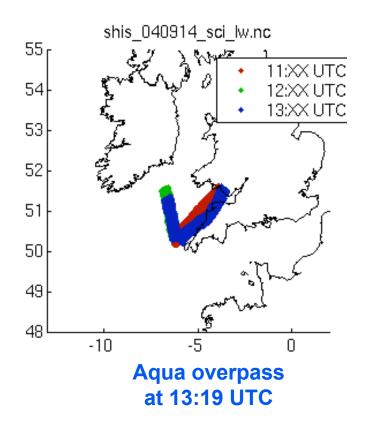


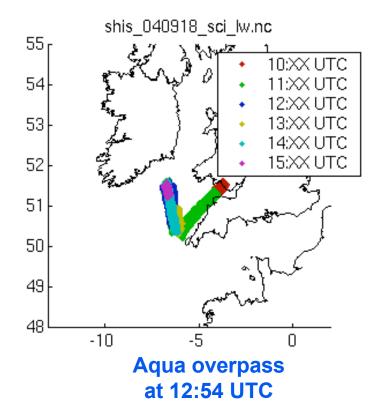


## **ADRIEX 040907**

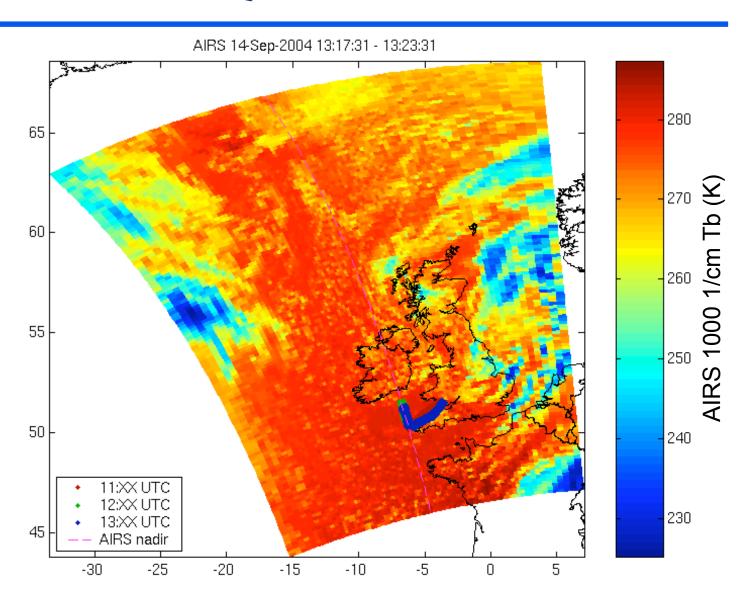


# EAQUATE Flights- 14,18 Sept



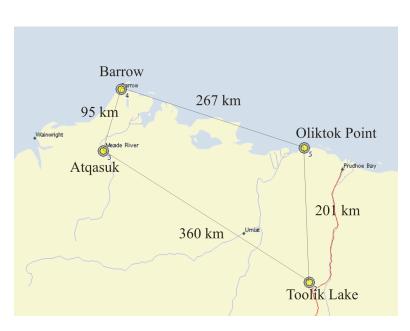


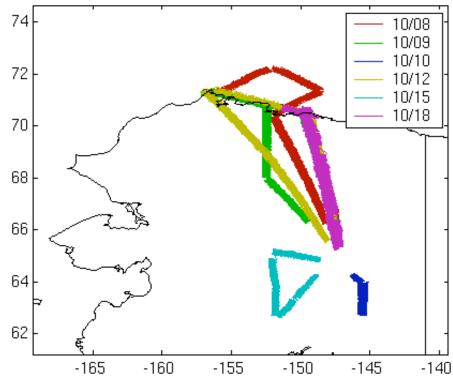
# EAQUATE 040914



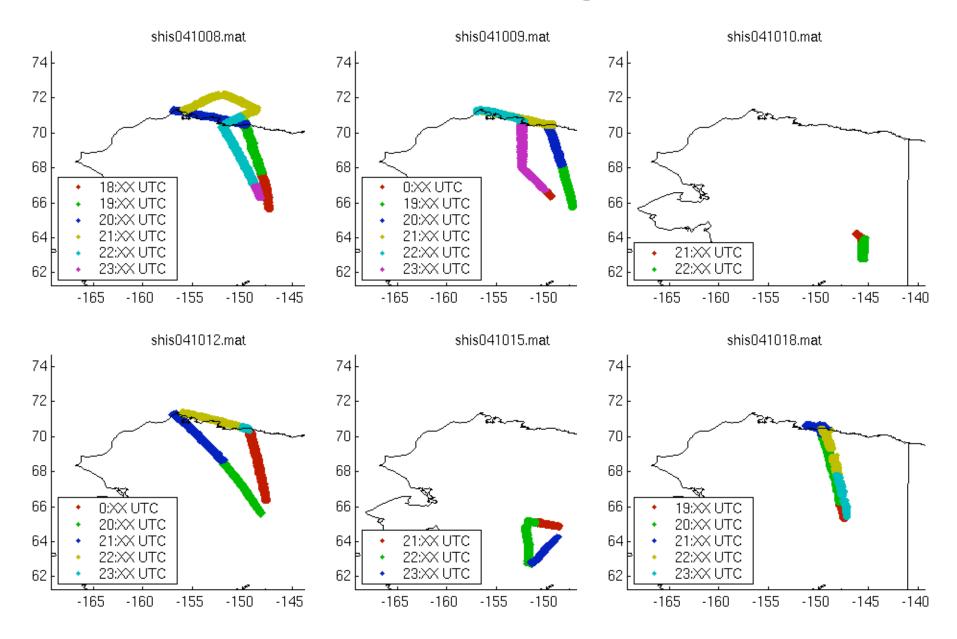
# MPACE Flights

Flight Date	Sortie #	Mission Summary	Start Time	End Time (UTC)
10/08/2004	292	Barrow/Oliktok overpass	18:00	24:00
10/09/2004	293	Barrow/Oliktok overpass	19:00	00:40
10/10/2004	294	A-Train Under-flight SE of Fairbanks	21:15	23:15
10/12/2004	295	Barrow/Oliktok overpass	20:30	01:30
10/15/2004	296	A-Train Under-flight West of Fairbanks	21:30	24:00
10/17/2004	297	Barrow overpass and Cloud Sampling	19:30	01:30 (not shown)
10/18/2004	298	Oliktok overpass and Cloud Sampling	19:15	00:30

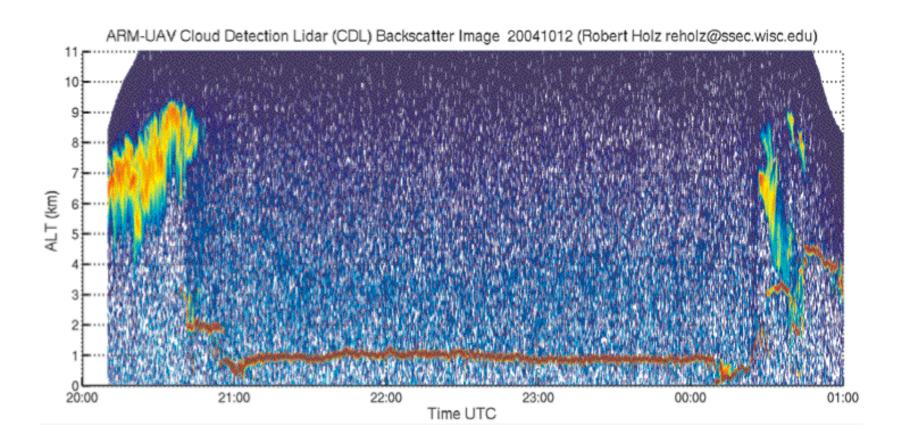




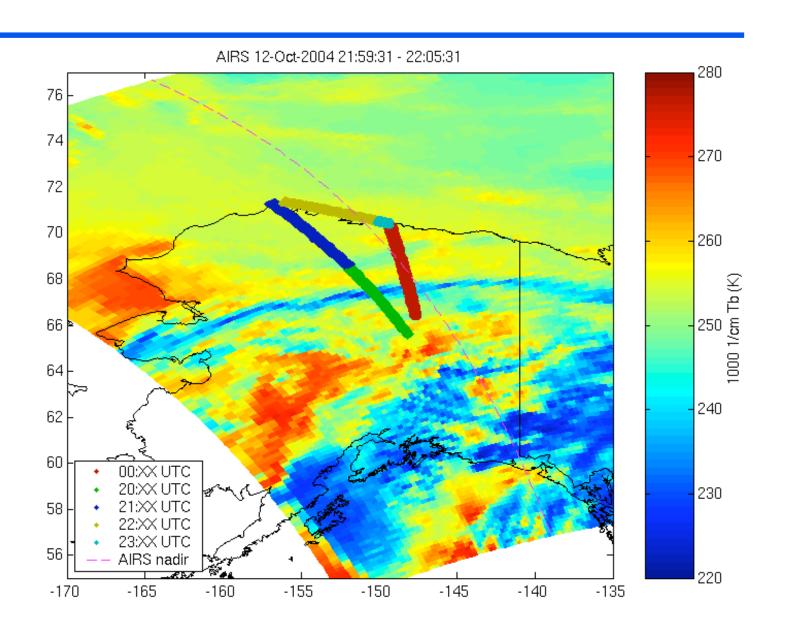
# MPACE Flights



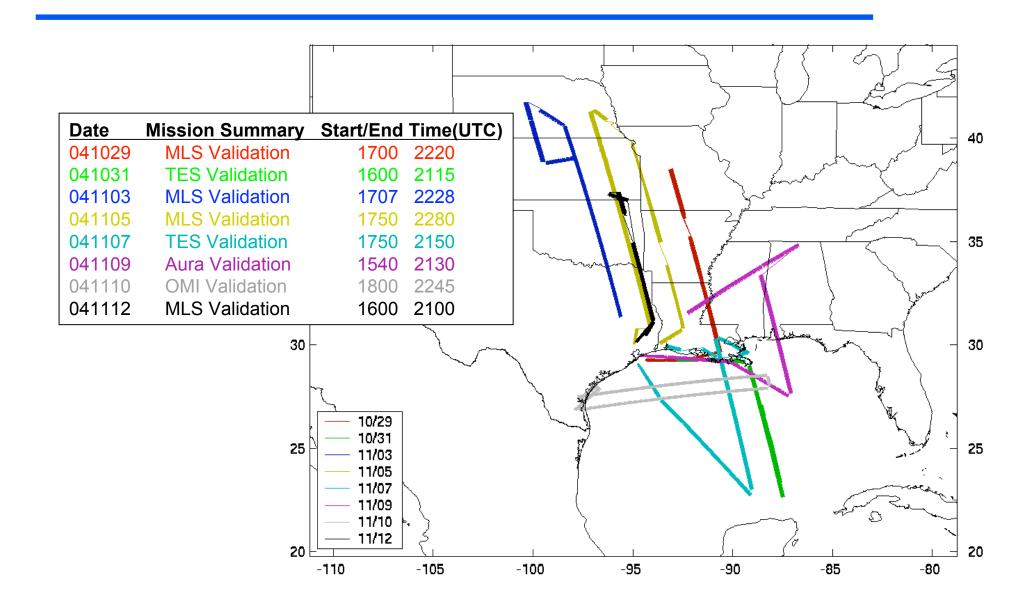
# MPACE 10/12



## MPACE 10/12

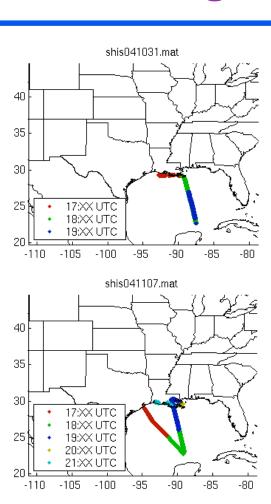


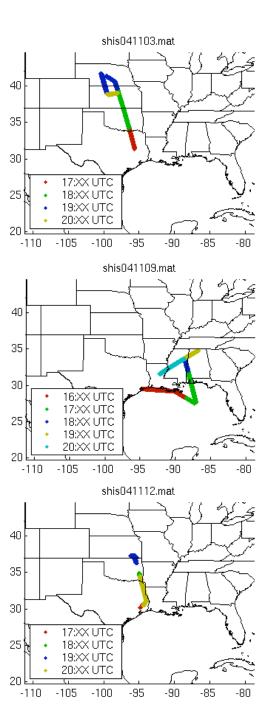
# **AVE Flights**

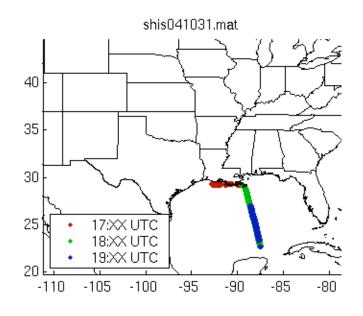


#### shis041029.mat 40 35 30 17:XX UTC 18:XX UTC 25 1 19:XX UTC 20:XX UTC 21:XX UTC -110 -105 -100 -95 -90 -85 shis041105.mat 40 35 17:XX UTC 30 18:XX UTC 19:XX UTC 20:XX UTC 25 h 21:XX UTC 22:XX UTC -110 -105 -100 -95 -90 -85 -80 shis041110.mat 40 35 30 19:XX UTC 20:XX UTC 25 21:XX UTC 22:XX UTC -110 -105 -100 -95 -80 -90 -85

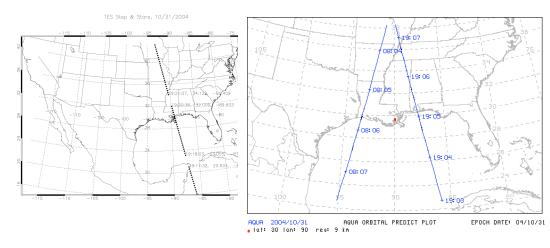
# **AVE Flights**

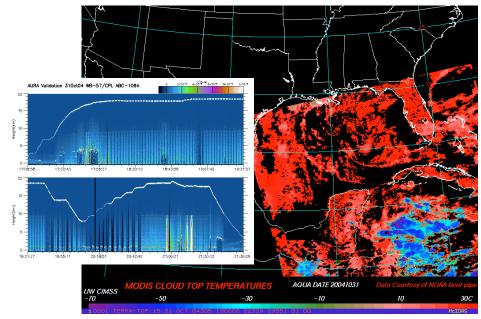


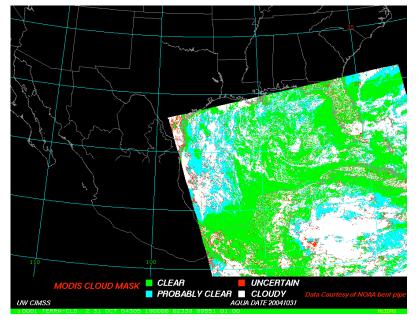




# AVE Flight 10/31



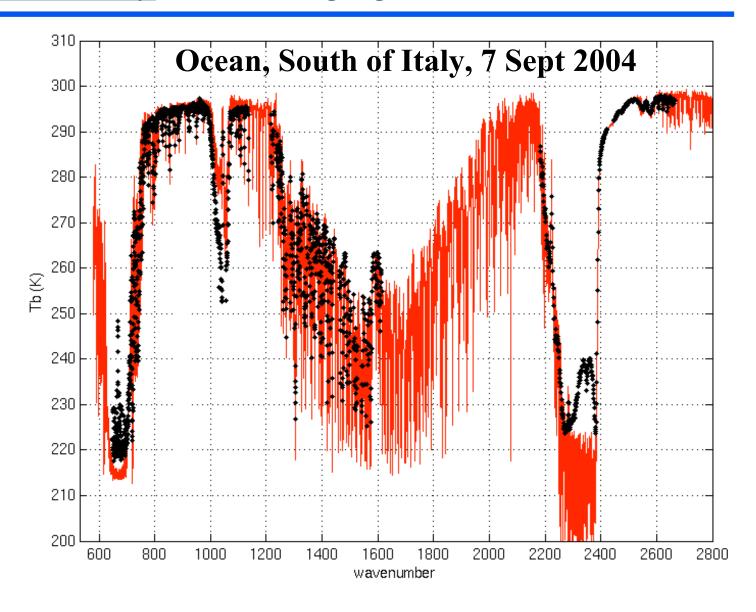




# 3. <u>Preliminary AIRS</u> <u>Validation Comparisons</u>

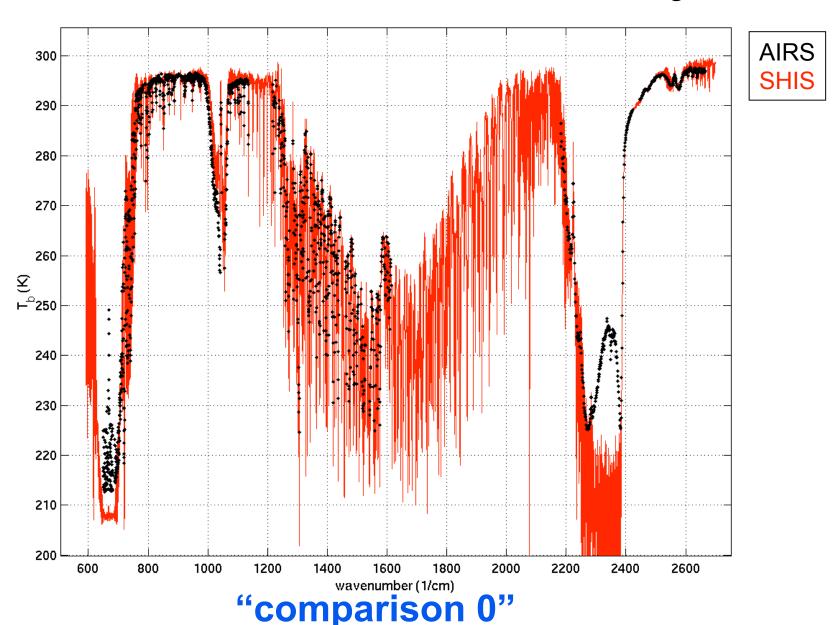
# AIRS/S-HIS ADRIEX Comparison

Preliminary: Just averaging S-HIS over AIRS FOVs



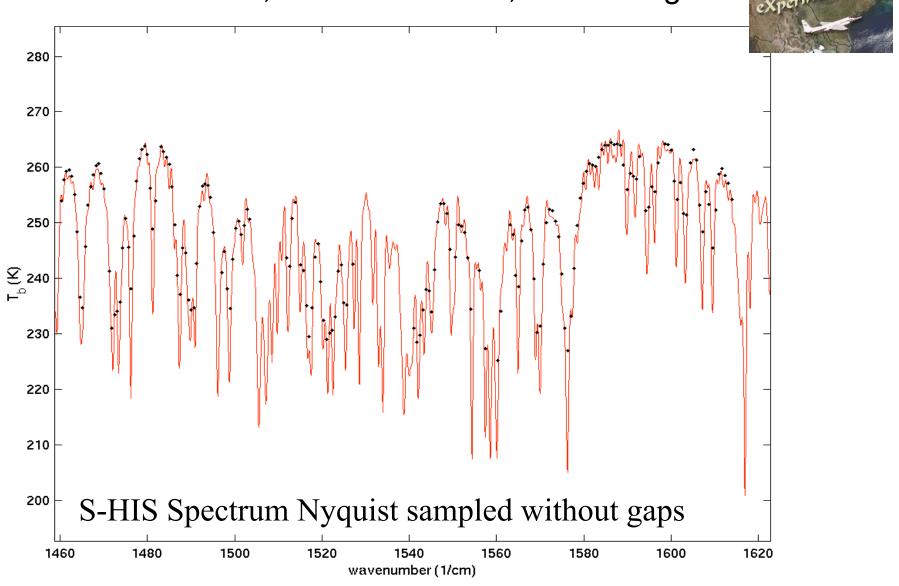
#### Perspective from 2002 Gulf of Mexico Comparison

8 AIRS FOVs, 448 SHIS FOVs, PC filtering

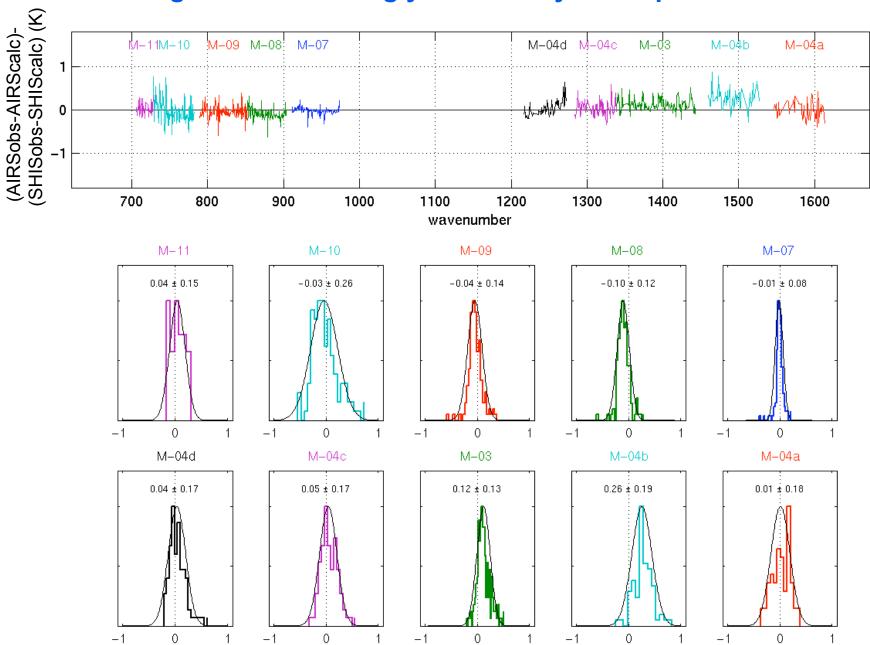


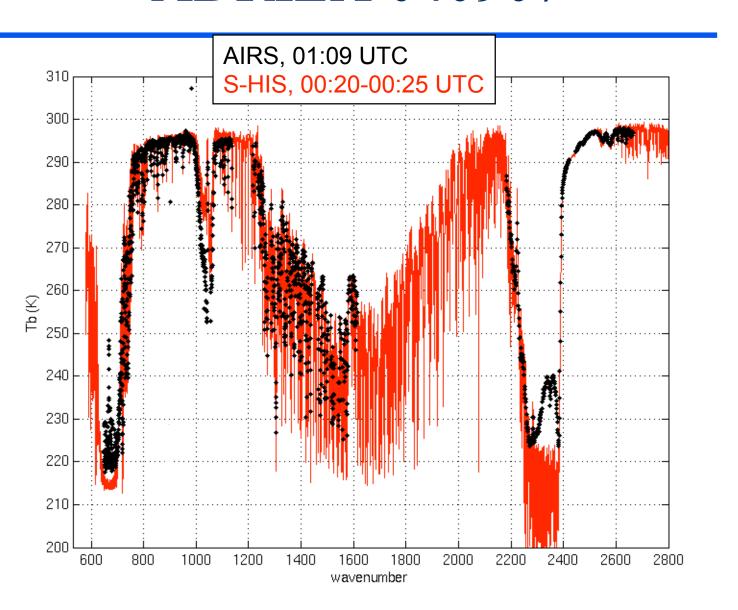
#### 21 Nov 2002 "comparison 0"

8 AIRS FOVs, 448 SHIS FOVs, PC filtering

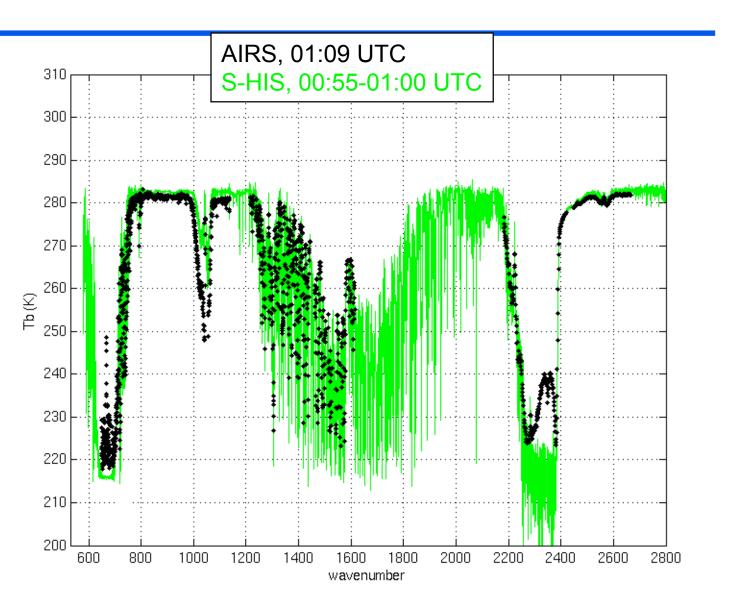


### Final "Comparison 2" (21 November 2002) Excluding channels strongly affected by atmosphere above ER2

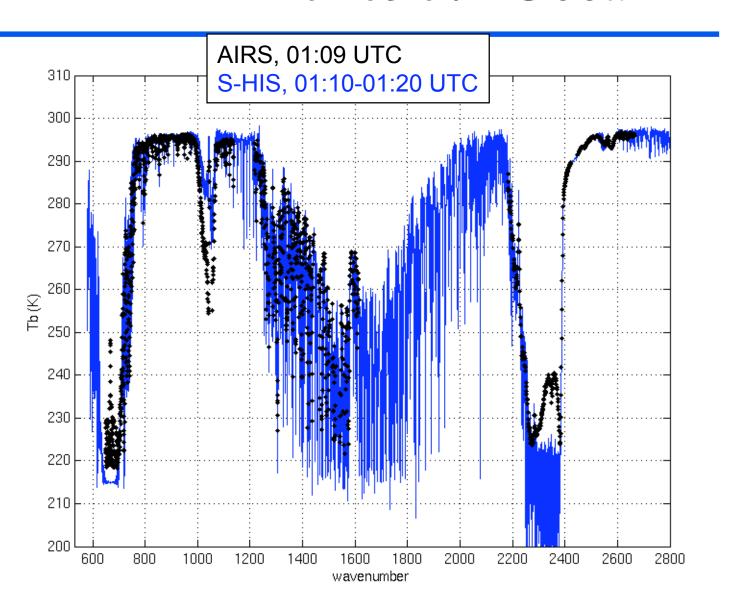


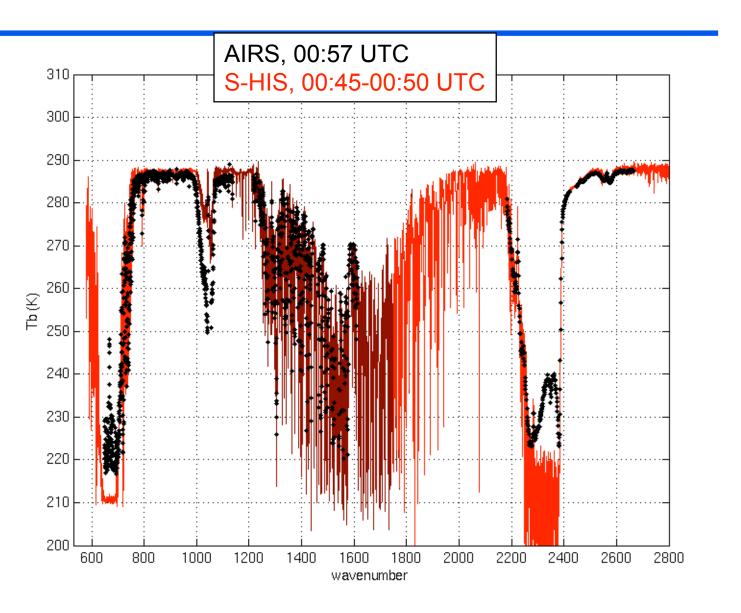


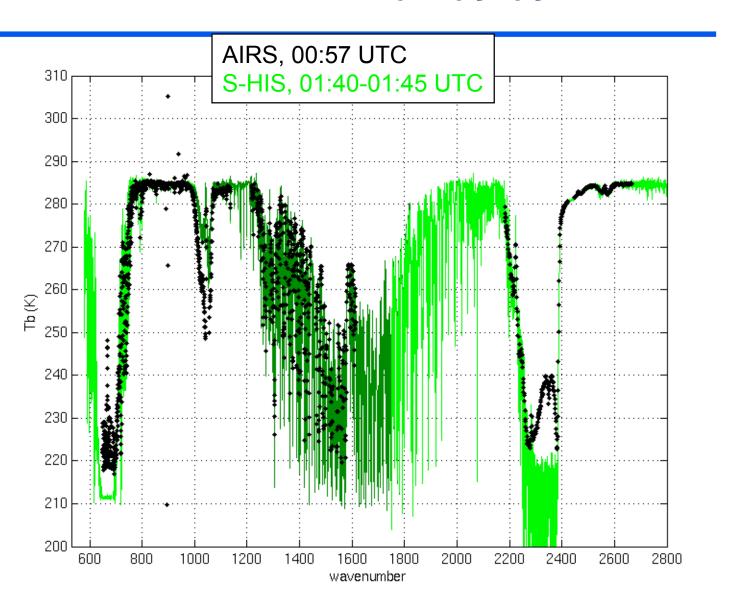
#### ADRIEX 040907- Mountains

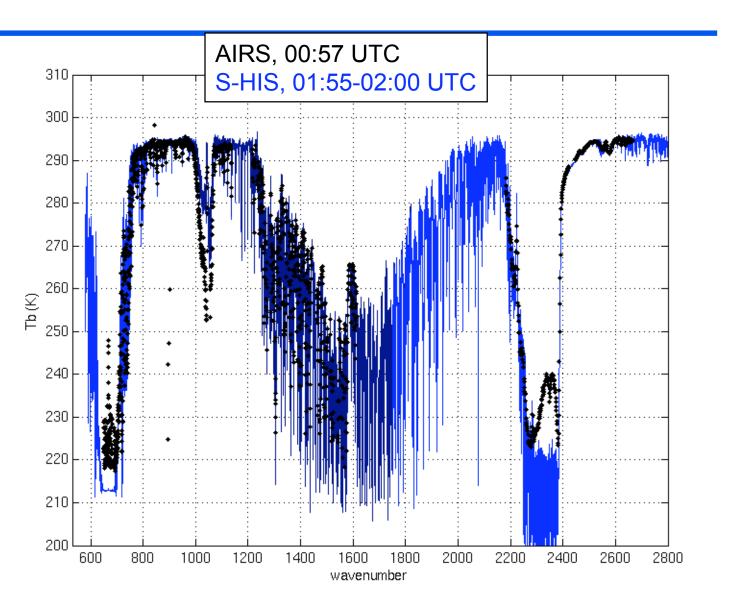


#### ADRIEX 040907- Ocean

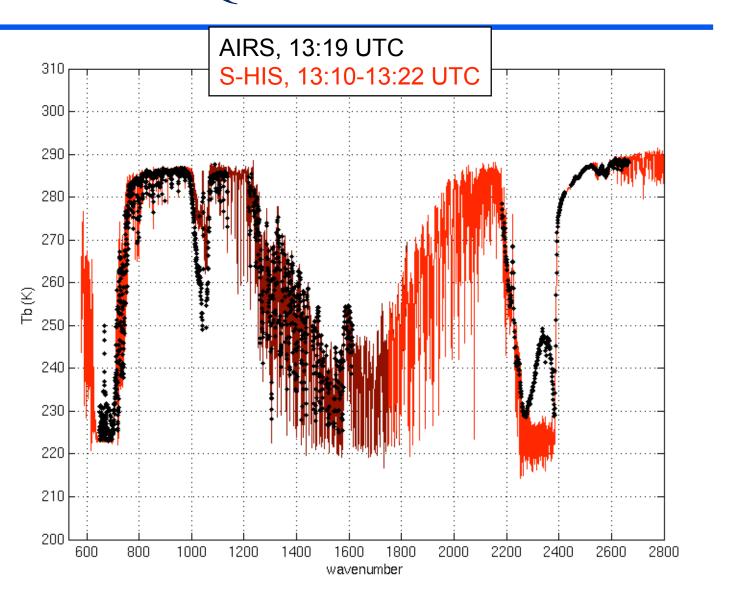




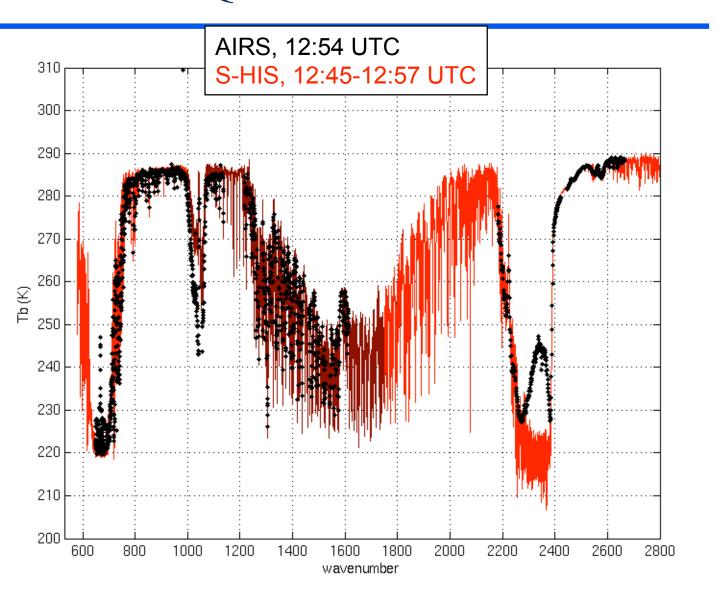


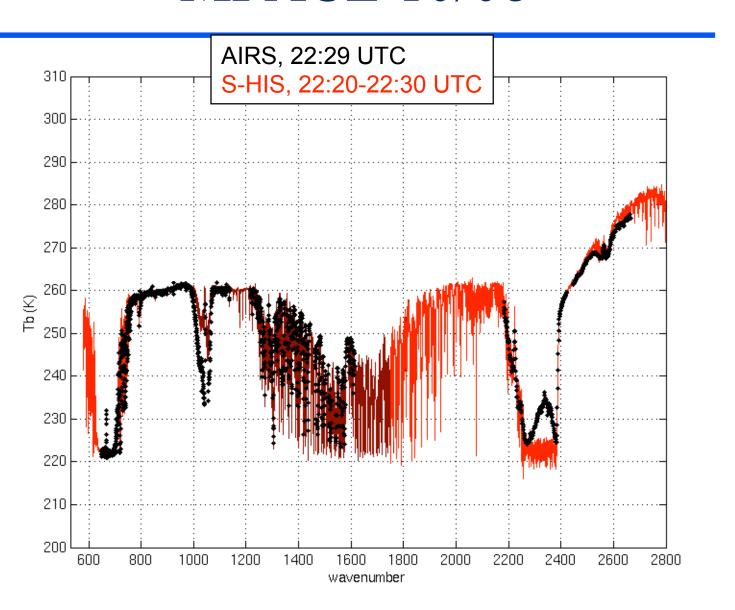


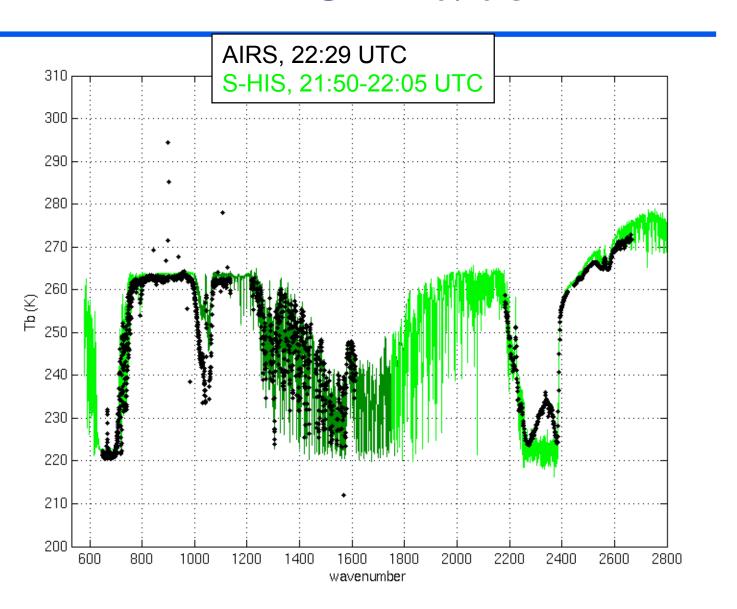
## EAQUATE 040914

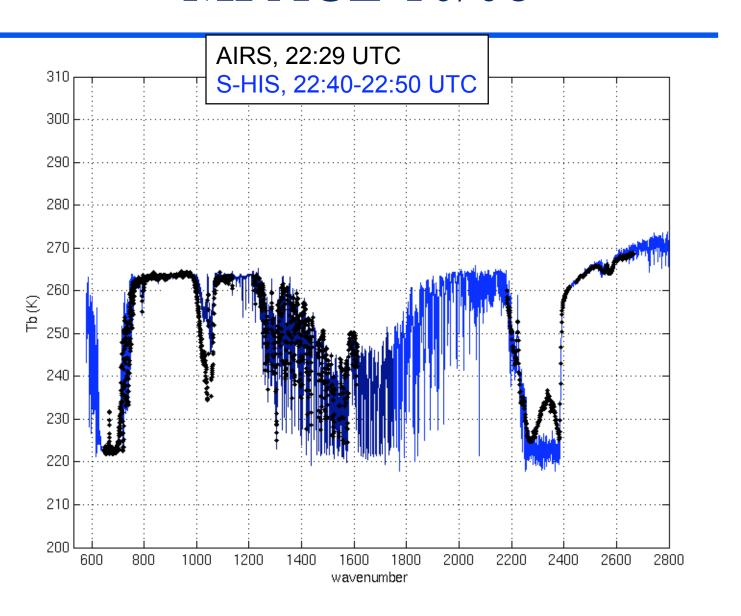


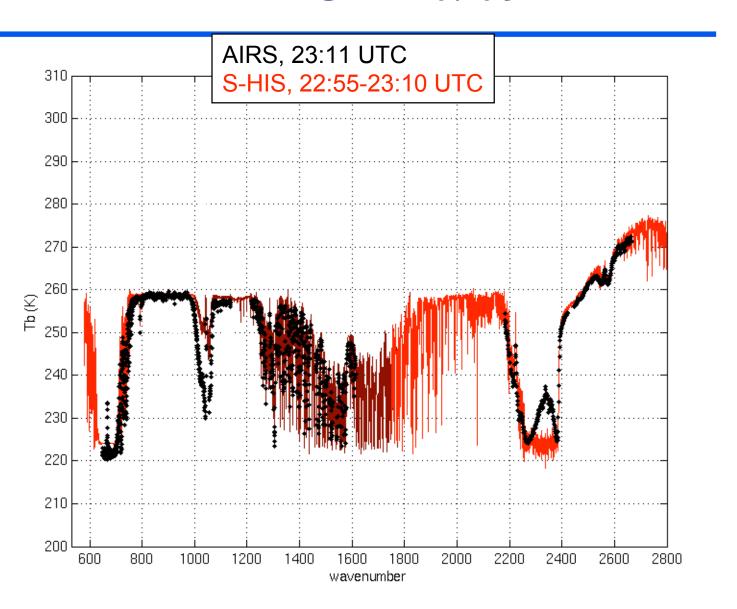
# EAQUATE 040918

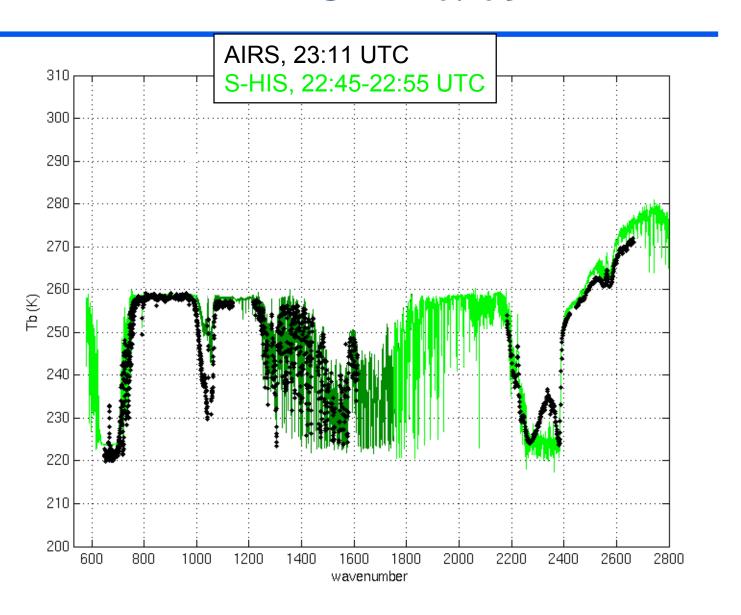


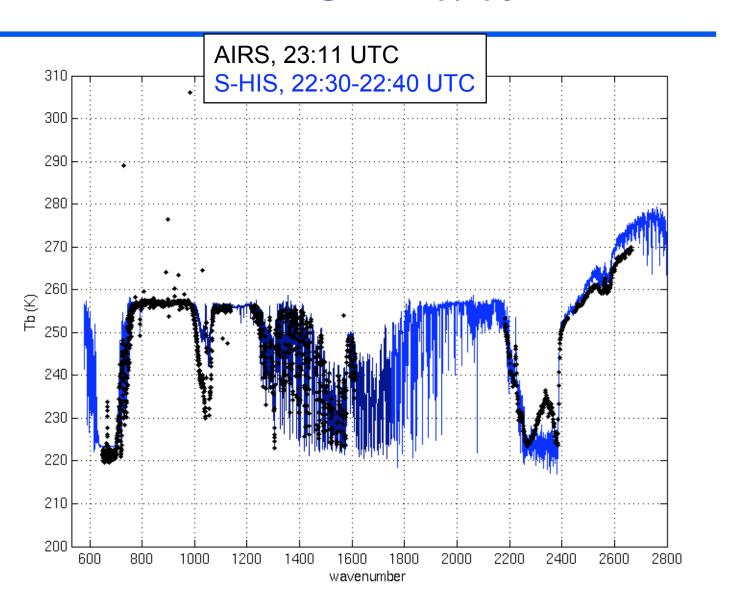


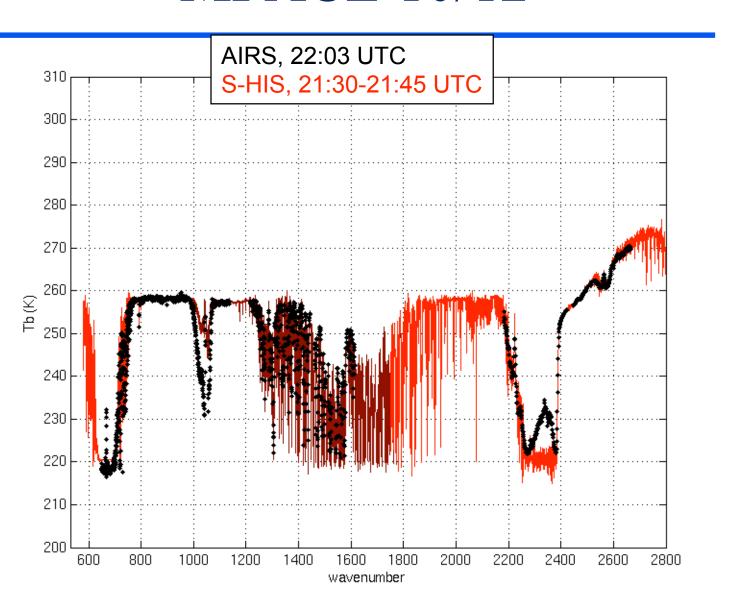


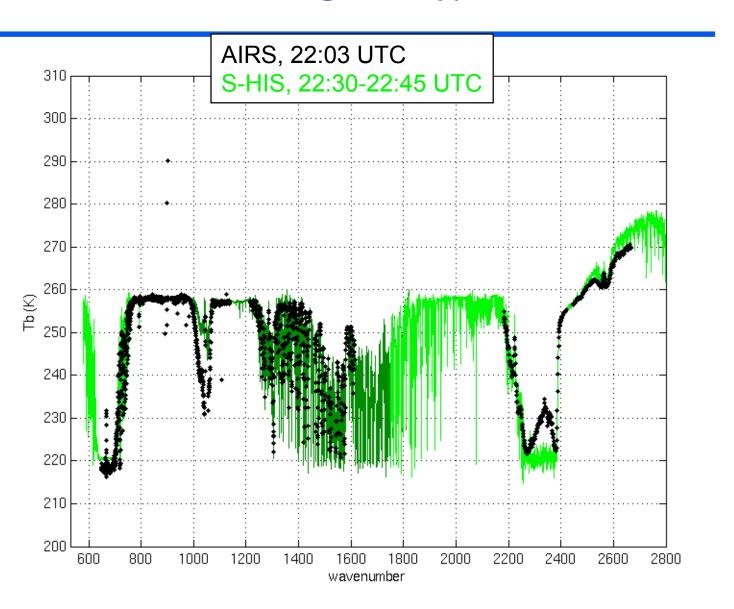




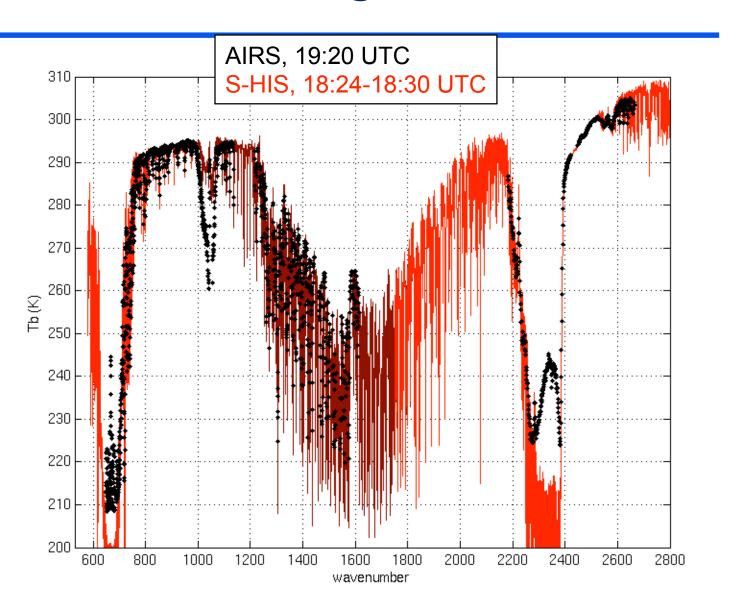




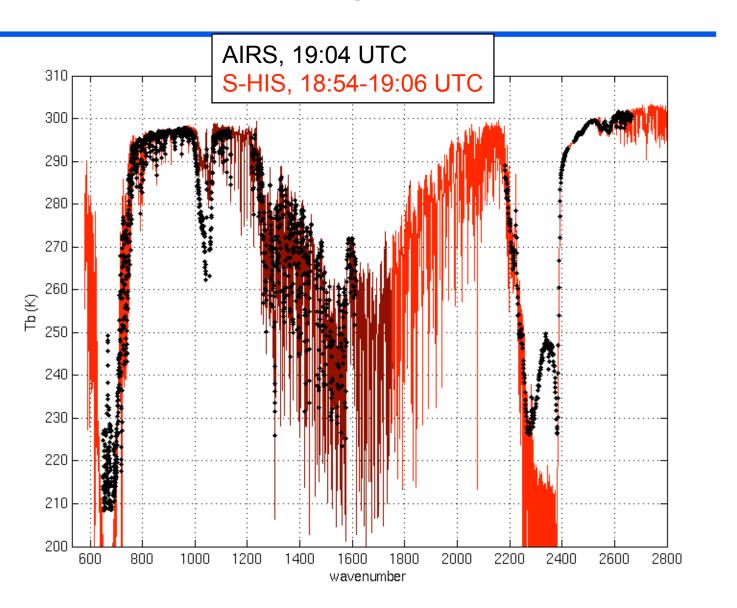




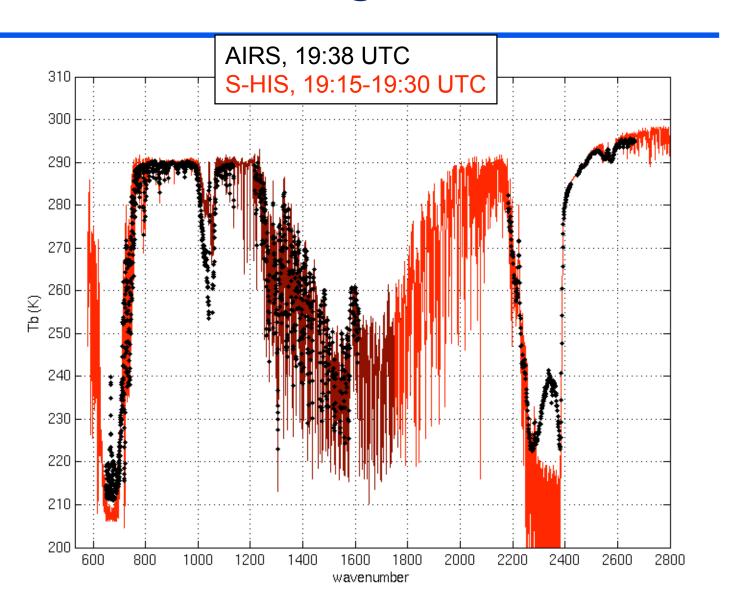
### AVE Flight 10/29



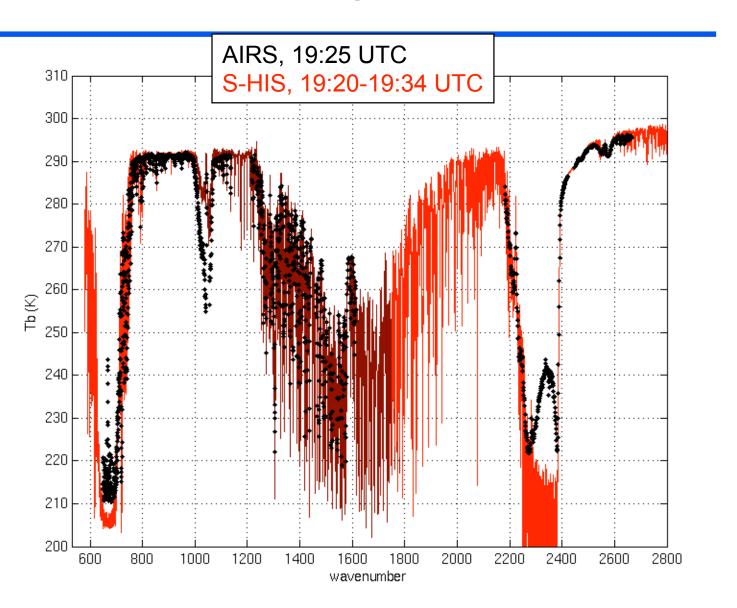
### AVE Flight 10/31



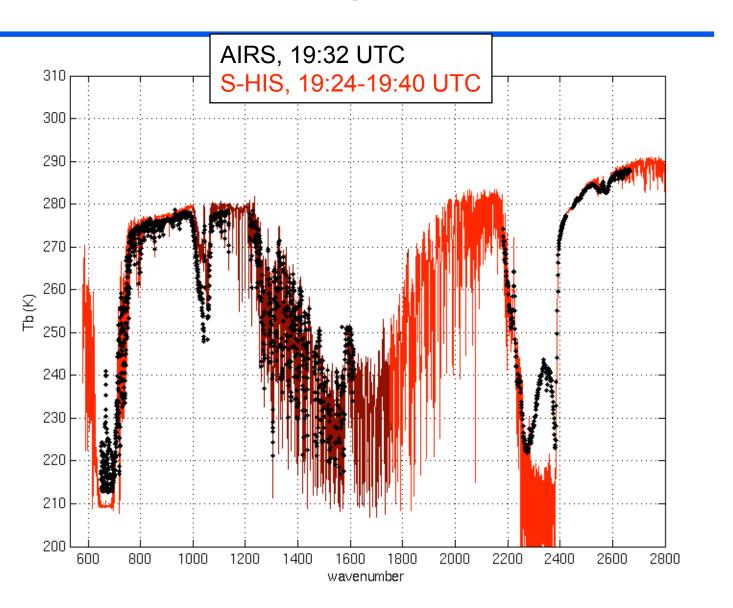
### AVE Flight 11/03



### AVE Flight 11/05



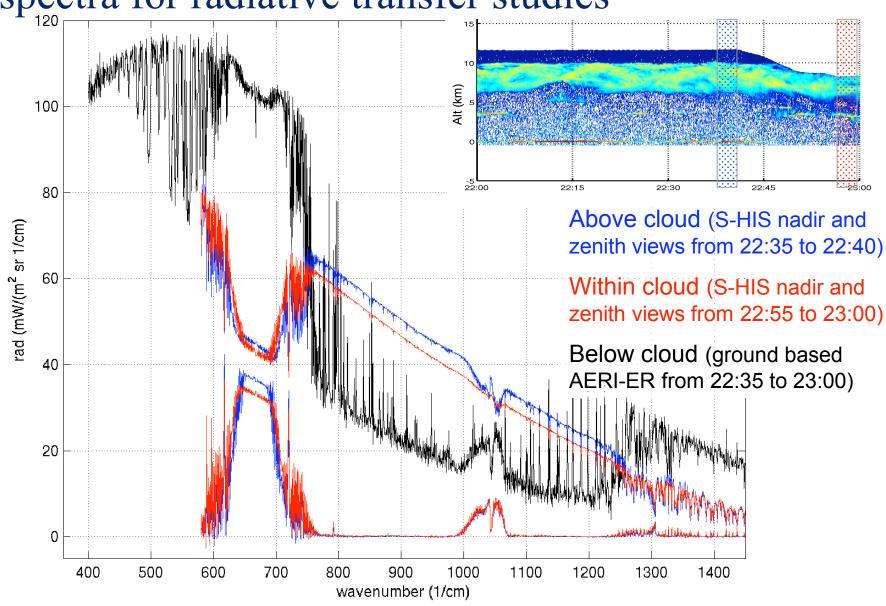
### AVE Flight 11/12



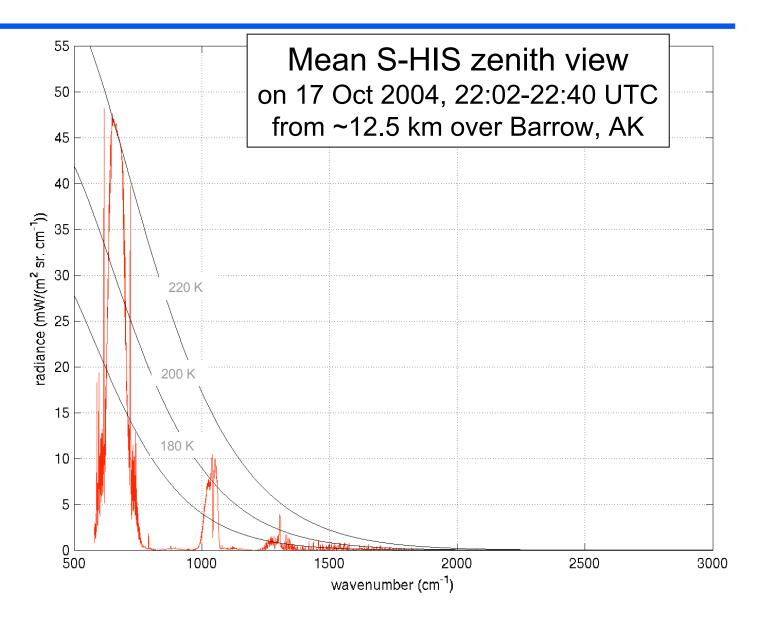
# 4. Interesting Tidbits

MPACE 10/17: Sample SHIS and AERI-ER

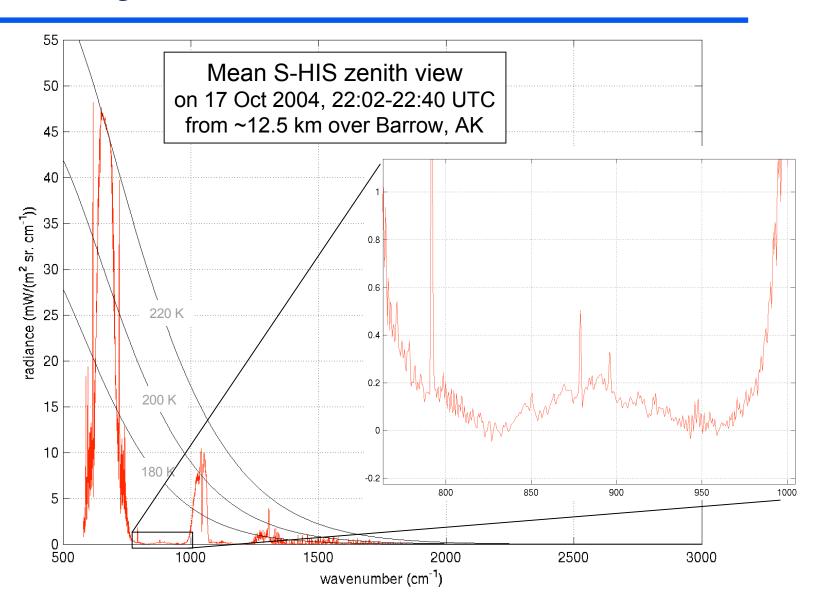
spectra for radiative transfer studies



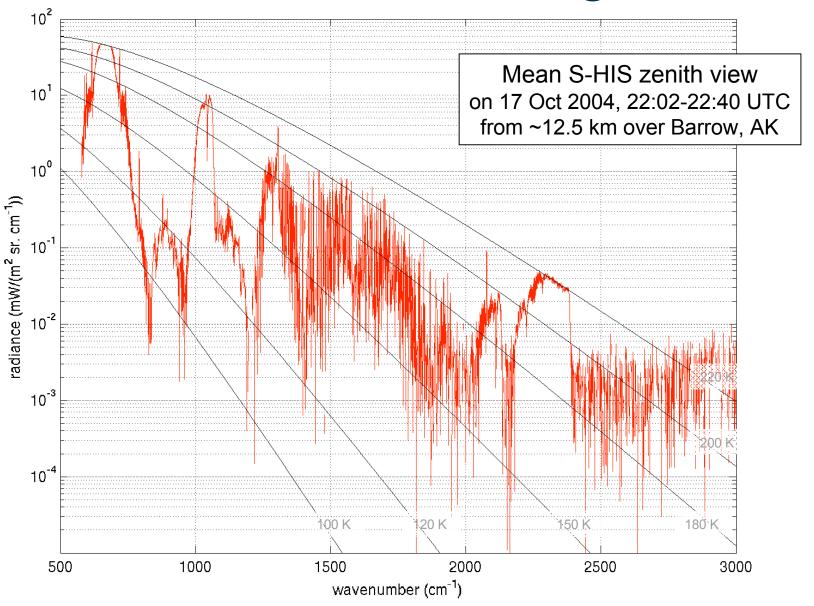
#### S-HIS Zenith views- MPACE, 17 Oct 04



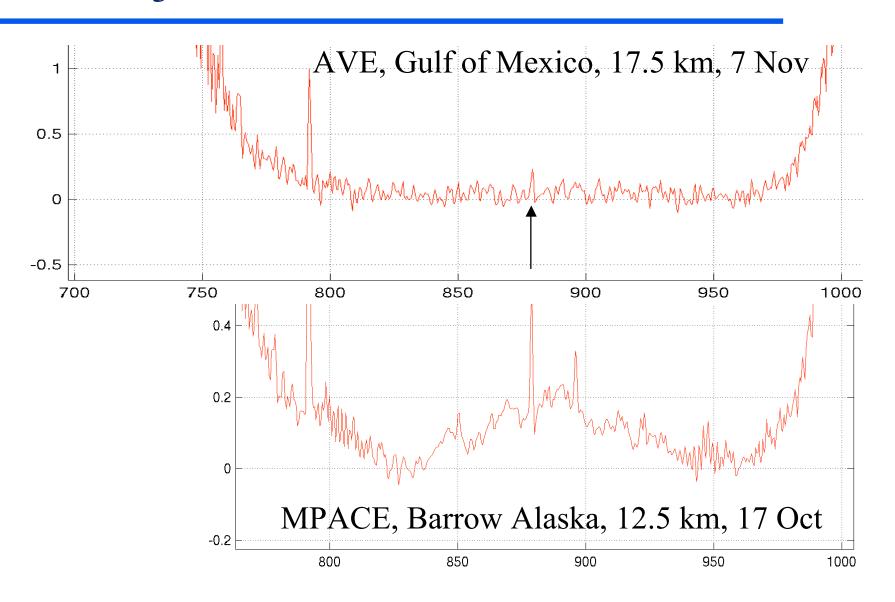
### HNO<sub>3</sub> in S-HIS Zenith views



### S-HIS Zenith views- log scale



### HNO<sub>3</sub> in S-HIS Zenith views



#### **Summary**

- We now have the data to establish a definitive initial radiance validation of AIRS— Absolute, nearly all channels, no model dependence
- A comparison of S-HIS with the NIST TXR transfer radiometer is being planned for 2005
- Future AIRS comparisons are expected to test long-term stability
- S-HIS is now setup to fly on the WB57